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ABSTRACT

A model of research and development in the toy industry is examined for information relevant to educational research. Three basic components (sales and marketing, preliminary design, and product design) are described. The author suggests that educational development should adopt a marketing perspective insofar as that entails conducting research and development with an eye on what will be acceptable in the classroom. Possible applications of the toy industry model are explored for the areas of needs assessment, prototype development and testing, decision-making, product development, and implementation and dissemination. For example, educators are urged to conduct research to determine sources of resistance to educational change and to uncover the market's preferences. (GW)

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RESEARCH AND DEVELOPMENT IN THE TOY INDUSTRY: ANALOGUES FOR EDUCATION

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RESEARCH AND DEVELOPMENT IN THE TOY INDUSTRY: ANALOGUES FOR EDUCATION

The 1960's and 1970's have seen educational development emerge as a new field of endeavor, with the bright promise of effecting major instructional improvement. Development, in this context, is defined as "the systematic use of scientific knowledge directed toward production of useful materials, devices, systems or methods, including design and development of prototype and processes (National Science Foundation, 1965)." Thus, development in education is committed to bridge the gap between research findings and classroom practice, through the introduction of more effective instructional products and processes. Despite this positive commitment, however, educational development's impact on student learning has been less than impressive; academic growth within the classroom continues at the same stubborn pace.

These results appear discouraging. The roots of the problem are undoubtedly many. Among them are perhaps the state of the educational research base and the short time frame under consideration, i.e., one cannot expect miracles in ten years. When one considers that educational development is in its infancy, the picture is not so grim. An infant enterprise must struggle and develop into maturity, like its human counterpart. Just as an infant benefits from modeling significant adult others, so too may educational development profit from modeling some of the processes and procedures used in older, more established development enterprises. In an age of accountability, it seems appropriate to look to the father of "account-

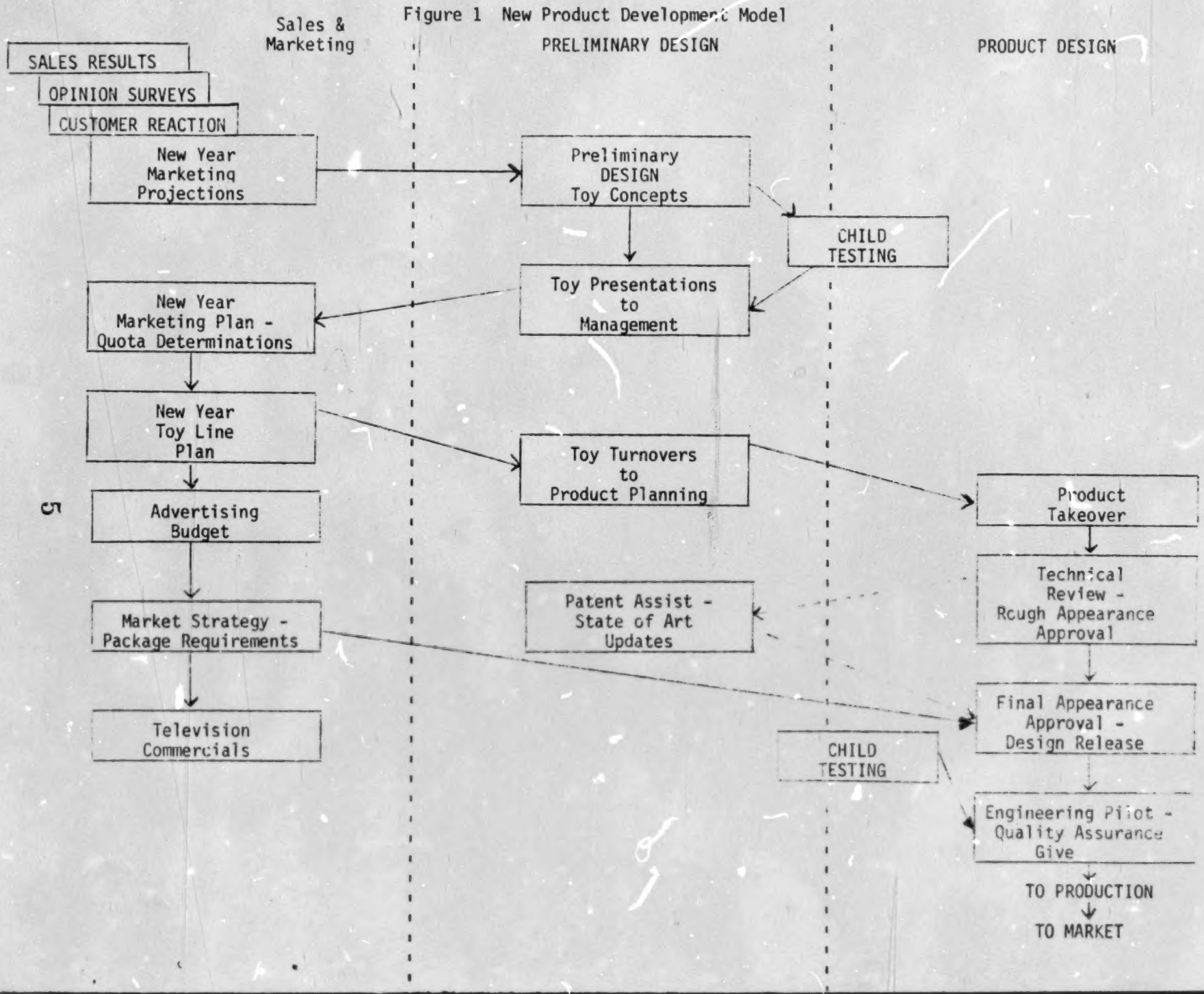
ability" as a source of possible inspiration, i.e., to the business community. The business community has a long history of developing and successfully marketing new products, and perhaps we in education can benefit from their experience. This is not to say that education does not have unique problems and goals, but rather that there may be processes and strategies used by business that can help educational development operate more effectively. Educational development deals with the real world, and it may be time to leave the ivory tower and learn how to more efficiently deal with that real world.

This paper will examine how the toy industry deals with the real world of new product development, based on interviews conducted with the manager of a major toy manufacturer. The model of development used by the company under study will be presented, and possible analogous applications to educational research and development will be discussed. While toys may seem frivolous to some in comparison with the serious goals of education, one must admit that the ultimate consumer is often the same. Further, in times that are paying increased tribute to the importance of attitudes toward school, the analogy may not be as far fetched. In any case, looking for broad commonalities rather than focusing on disparities will hopefully provide some new insights.

The Model

Figure 1 depicts the process of new product development in one major toy company. The process normally represents an eighteen month cycle, though some toys may take up to five years to develop. The model shows three basic

Figure 1 New Product Development Model



components in the development cycle: sales and marketing, preliminary design, and product design. Contributing to each component are the efforts of various company divisions and staff members. The visual representation of this model is perhaps misleading in that it suggests a clear, and equal, delineation of responsibilities among the three components. In actuality, though, there is a complex interplay among the components, which is negotiated by a product planning division. Product planning is, in fact, a division within the company's marketing effort. Ultimately, then, the sales and marketing component of the model plays the most significant role in supervising and contributing to the new toy development process.

It is, of course, reasonable that sales and marketing should play the dominant role. The toy industry's objective is quite simple: to produce products that can be successfully marketed and sold. As the model shows, sales and marketing represents both the beginning and the end of the new product cycle.

Phase one of the toy development process corresponds to needs assessment and preliminary specification activities in Educational R & D. As Figure 1 depicts, the process begins with an analysis of sales results, opinion surveys and customer reactions to existing products. The analysis produces estimates of what consumers seem to be looking for and what kinds of toys they should be willing to buy. This information is summarized in the New Year Marketing Projections, and gives staff members broad limits for arriving as a preliminary design.

The preliminary design component houses the research capability of the company and is responsible for developing new toy concepts, in a process similar to educational prototype development and try-out. Within the broad constraints

set by people in marketing, staff involved with preliminary design freely generate ideas, and then evaluate the ideas against production feasibility and mandated child safety requirements. Such evaluations require the preliminary design staff to keep current with the latest manufacturing techniques, and where possible to expand on those techniques. The new toy ideas which are deemed most promising and most feasible are converted into rough models. With most ideas, there are multiple directions that the toy might take. Each of these directions is embodied in a separate prototype. These rough models, in turn, are subjected to child testing, under the auspices of the marketing research department. The testing process involves both children and their parents, and furnishes input into what direction the product should take. The tests also focus on determining the "play value" of the projected new toy, i.e., is the toy one that children will freely choose? Is it one that children will return to play with? How does the parent react to the toy idea? On the basis of these tests, the most promising alternatives are refined and further tested, in a familiar test-revise feedback loop.

After the prototype testing cycle, the best new toy ideas, along with rough costing estimates, are presented to management. Management makes a decision on which toys to produce, based on multiple criteria. Among these criteria are:

1. The results of child testing
2. Production feasibility and profitability.
3. Assessed marketability
4. Effect on present product line
5. Market development and promotional requirements
6. Legal safety requirements

Based on these considerations, the New Year Marketing Plan and Quota Determinations are made, i.e., what toys will be produced, how long is required for production, and how many units are expected to be sold. The New Year Toy Line Plan, the overall sales plan for the year, is also outlined at this time. The toys chosen for production are then turned over to product design component for full development, the counterpart to educational final product development. Preliminary manufacturing schedules are outlined. The tooling department develops the new tools needed to produce the toy. The sculpting department develops the external features of the toys and helps produce the necessary molds. Visual design works on how the final product should look, and on packaging requirements. The goal of these inter-related processes is to produce a working model that meets the specifications established for the envisioned toy. The model, in rough final form, is submitted to management for approval. Some toys are eliminated at this stage; others require modifications. Some modifications may be dictated by marketing strategy or by packaging requirements; others focus on ways to reduce costs or to manage unforseen or expensive obstacles.

These problems are often solved with "state of the art" updates, particularly through a process known as patent assist. The patent assist involves examining issued patent disclosures relevant to the problems at hand. Patents offer, in effect, a chronological description of each field as it has developed, furnishing a description of substantially all the methods and means which have been employed to solve various problems. The patent disclosures, then, are a valuable source of new technical developments which have resulted from extensive research and development and are often available well in advance of the usual technical publications.

When all problems have been alleviated, the new toy is re-submitted to management for final appearance approval. Again, at this point, management may decide that the cost is too great, given the potential return, and may drop a particular toy from the line. After the final appearance approval, marketing research continues child testing on the various play aspects of the toy, and to assure its safety. While the focus of earlier testing was on the play value, or child appeal of the toy, the testing at this stage centers on whether the toy operates as it was envisioned, i.e., does it do what its specifications say it will do, and is it sufficiently well designed to meet safety requirements. Any malfunctions that are discovered must be rectified.

As the product reaches its final stages of development, staff members in product design conduct a pilot run of the new toy. Approximately fifty units are manufactured and distributed to families for home testing. This in-home testing, a hurried counterpart to field testing, provides data for quality assurance. The return rate, or number of users reporting problems, determine which toys progress to the final stage. Those toys that do not meet the criteria may be sent back for re-design, or if the problems are too great, the toy may be rejected. Those toys that do meet the grade are put in full scale production.

Meanwhile, staff members product planning has been working with advertising, merchandising and public relations to develop complete publicity plans for the toy. Television commercials are shot, magazine lay-outs developed, and in-store displays pieces created. The desired end of such planning is that the new product is sold before it comes off the assembly line.

Applications for Educational Research and Development

Analysis of the toy industry's model of development reveals that marketing and potential marketability represents the beginning and the end of the development cycle, as well as playing a major role in between. A central thrust of the comments presented below is that educational development, too, should adopt this marketing perspective. This is not to say that educational research and development should adopt the profit motive (although a profitable enterprise would, indeed, be nice), but rather that educational R & D should be conducted with a constant eye toward its potential market, i.e., what goes on and will be accepted at the classroom level. Other strategies and procedures used by the toy industry also seem to have promising possibilities in the educational context. The possible applications discussed below are organized around the phases of development to which they apply.

Needs Assessment and Specifications

Needs assessment, in the toy industry, draws from several sources. Management depends not only on what people say, e.g., opinion surveys, but on what they do, as well. Marketing research has shown that people may react very favorably to a new product or idea, but may not buy it when it reaches the market. Education might gain by this experience. Our needs assessments, when used at all, typically are based primarily on what people say they want or need, or on how they respond to a questionnaire. Little consideration is given to whether they will act on what they say, or to how they have responded in action in the past. Rather, we seem to assume that if a segment of the population says they need or want a product to accomplish a specific goal, they will automatically accept and use the finished product, regardless of its form. This assumption, in light of marketing research, is highly ques-

tionable, which suggests the need for additional sources of information to formulate more meaningful specifications.

Prototype Development and Testing

Prototype toy development, or Preliminary Design, is a highly creative endeavor. Staff members in this section are chosen for their creative and synthetic abilities. The objective to be reached, i.e., to produce toys that will sell X number of units at a given profit, it is very clearcut, but the means to reach the objective is left wide open. Further, it is common to have staff members from various disciplines, e.g., chemistry, engineering, working on the same idea. There is no reason why prototype development in education should not be characterized by these same attributes. Given the state of educational research, the means to reach any particular objective are rarely, if ever, clearcut. It seems reasonable that concentrating creative talent at the prototype stage to freely generate alternative ideas might well produce more effective strategies for a successful final product. Further, directing the talents of persons from different disciplines, e.g., sociology, psychology, etc., as well as subject matter experts, toward a particular problem might yield a more viable solution. If producing a single toy requires the synthesis of several disciplines, then certainly solving complex educational problems requires a multi-disciplinary approach.

Prototype Testing

Prototype testing in the toy industry focuses exclusively on the affective dimension, i.e., whether the child and parent react favorably to the toy. While certainly educational products have to strongly consider other dimensions we need to do more than give lip service to the concept of children's affect

toward our products. If we conceive of development's mission as providing meaningful alternatives for students, then we might consider, during our testing cycle, whether our alternatives are ones that students indeed want, or at least respond to somewhat positively. Unwanted, or negatively valenced alternatives, to say the least, seem to lack meaning.

Prototype testing in the toy industry also offers the advantage of considering multiple alternatives over time. Planned variations of each toy idea are tested to give shape to the final product; a single alternative is not selected until the product design stage. Such a strategy is particularly applicable to educational development, where the strategy to reach a goal is not known. In addition to producing a more effective final product, planned variation testing would contribute to the educational research base.

Another salient aspect of prototype testing in the toy industry is the inclusion of the parent as well as the child in the process. The rationale is that although the child is the user of the product, the parent must be willing to buy the toy. Similarly, in education, though the student is often the ultimate target of the product, in most cases the teacher must be willing to use or "buy" it. Soliciting teacher reactions early in the development cycle may avoid full development of some products or processes that will just sit on the shelf or never be properly used.

It is interesting that the toy industry chooses to house the testing responsibility in a separate department from the developers. Such a strategy apparently further objectifies the data-based interpretations and may lead to more valid conclusions.

Decision-Making at the Prototype Stage

Just as the toy industry considers multiple criteria to determine which

toys warrant final development, so too educational development might consider some additional criteria. In educational development, there is great emphasis on the empirical data derived from prototype try-outs. Though certainly this data is an important and valid source of information, other factors might also be profitably considered. Technical sophistication or empirical success, as we well know, is no guarantee that a product or technique will actually be implemented. Educational development is full of good ideas that were not packaged in truly useable form. For example, in retrospect, we might look at the idea of individualizing instruction with early objective based systems. Was a feasibility or marketability criteria ever applied to this idea? For example, is it really feasible for a teacher to keep track of a myriad of minute objectives for each child? The answer is intuitively no, and teachers' reactions to such systems support intuition. There are some very appealing ideas in educational academia, but it seems we must first ask, "Are they feasible on a classroom level? Can they be packaged in useable form? Will they be accepted?" before launching into the expensive phase of full scale final development. Of course, answering such questions will require additional research into what teachers and others involved are willing to accept and use. Considering the total market at this early stage may, however, save some costly disasters.

Product Development

Product development represents the technical transformation of a rough model into a working marketable product. The technical processes utilized by the toy industry offer little for educational development, and certainly we would not want to adopt their seemingly haphazard field testing strategy.

However, allowing the market to shape the development of the final product is a viable technique - one already utilized by those educational development agencies which utilize field test data for product revisions. In addition, there are several other processes at this stage that warrant attention.

First of all, there is management's willingness to abandon an idea or product even during the final stages of development. At times, in education, we seem unable to give up development of an idea. even though it has been shown to be unworkable. Although the decision should not be taken lightly, we should be willing to say "no" regardless of the stage of development, rather than waste additional energy with an untenable project.

Secondly, an educational analogue to patent search and disclosure intuitively seems to be a very beneficial idea. The patent search process allows companies to benefit from the positive and negative experiences of others. There is no such ready source of information for educational development. A similar compilation of the experiences of educational research and development agencies, utilized at an early stage of development, would allow an agency to avoid needless pitfalls and capitalize on successful methods. In short, a formalized information sharing vehicle for educational R & D should further the art of educational development.

Finally, safety assurance is a dominant focus of child testing during the final stages of development, as well as being a concern at earlier stages. The toy industry is regulated by Child Safety Laws which set standards for toys for different age groups. The laws are enforced by the Federal Drug Administration. If a toy is found that does not meet the mandated requirements, the FDA forbids its sale, and the toy is immediately taken off the market. There are no such regulatory boundaries for educational products

and processes. Yet, it seems we too need to set standards to assure that our products are safe, that they are in no way detrimental to students. While perhaps we do not require formal federal surveillance, we do need to set strict standards setting forth what tests and procedures a product or process must undergo to assure it is producing only positive outcomes, and is not causing any adverse or harmful side-effects. Such a system would protect the interests of potential users.

Implementation and Dissemination

Dissemination in the toy industry is a conjoint process with development. In education, dissemination often seems an after thought. Yet, if we cannot disseminate a product, and ensure it is properly implemented, the effort of development is largely wasted. It appears that dissemination and marketing must become an integral part of the development process. If we know that teachers, or others involved, are generally resistant to new ideas, then, we need to find out why they are resistant and develop ways to overcome the resistance. Simultaneously with developing a new product or program, then, we need to consider how it may be presented so that it will gain market acceptance. We need to find methods to maximize the potential audience who will be willing to use the new idea. The business community has an advantage in this area; they seem to know their market well. We in educational development need to conduct research to explore sources of resistance to educational change and to uncover our markets' preferences.

A Final Note

In educational development, we are well attuned to the process of setting objectives and then assessing how well those objectives are met. This is the

hallmark of a systemmatic development effort. Hopefully, we always apply these processes to the products we develop, but do we apply them equally to ourselves and our organizations? Accountability is often viewed in terms of student performance or teacher performance, but the concept applies equally well to the development enterprise.

At least one firm within the toy industry has applied a formal system of accountability to its own organizational structure. It is a goal setting system in which each employee establishes with his/her management precisely how the organization's needs for the coming year will be met, and more specificially, what objectives each employee must accomplish. During the year, the employee is accorded considerable latitude as to how to meet the objectives. At the end of the year, actual results are jointly reviewed, and the degree of success is assessed. The process is then begun anew. The system allegedly promotes: 1) motivation and commitment; 2) more complete planning; 3) more effective organizational coordination; and 4) personal development and growth through assumption of responsibility.

Such a system may appear mechanistic to some, but it does provide a tenable framework for assessing how well we are doing, and analyzing our strengths and weaknesses, as well as building in a powerful and viable incentive system. If we can apply the "feedback-revise" cycle to the process of development itself, and repeatedly apply formative evaluation to our own structures and procedures, we will undoubtedly further the state of the art of educational development.

Conclusion

Educators typically disdain the profit goals of the business community

as unworthy, and simultaneously dismiss their strategies as well. Some of us in educational research and development tend too heavily toward the theoretical and the beautifully ideal conception, and dismiss as invalid the intrusions of the real world. If, in fact, we are to bridge the gap between research findings and classroom practice, and effect positive change, we need to drop this posture and proceed on a more practical level. The business community, or more specifically the toy industry, has a proven record of successfully working within real world constraints. Adapting some of their strategies and processes, as outlined in this paper, may produce a more successful educational development effort. Certainly our goals are more worthy than the almighty dollar - all the more reason why we should strive to meet these goals in the most efficient and effective manner possible.